

2. *RHEXIA MARIANA* L. Sp. Pl. 346, 1753. A species of sandy swamps, New Jersey to Florida, mostly along the coast, West to Louisiana and Texas, North along the Mississippi river to Southern Missouri, Illinois and Kentucky.

Specimens examined: Missouri: Butler County, *Eggert*, July 27, 1892; *Campbell, Bush* 145, July 20, 1893; Pleasant Grove, *Mackenzie* 322, July 17, 1897; *Bush*, 274, August 13, 1899; Neelyville, *Russell*, July 4, 1899.

3. *RHEXIA VIRGINICA* L. Sp. Pl. 346, 1753. A species of low meadows and sandy swamps, ranging from Maine to New Jersey and Florida, mostly near the coast, West to Louisiana, and North along the Mississippi river to Southeastern Missouri and Southern Illinois.

Specimens examined: Missouri: Malden, *Bush* 146, July 22, 1895; Pilot Knob, *Glatfelter*, August 20, 1895.

COURTNEY, MISSOURI.

LYCOPODIUM FLABELLIFORME.

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Lycopodium flabelliforme (Fernald), n. sp. *L. complanatum*, var. *flabelliforme* Fernald, RHODORA, iii. 280 (1901); Gray's Man. ed. 7, 57 (1908). Caule repenti superficiali, ramis 2-3 dm. altis rigidule erectis mense Octobri tertio vel quarto anno fructiferis, hornotinis usque ad 3 cm. attingentibus profunde bipartitis, partibus 5-7-furcatis, lobis dorso planis vel convexis subtus concavis 2-3 mm. latis rarer secundum anno procrecentibus; foliis minutis adpressis, pedicellis robustis saepe furcatis, pedunculis ca. 7 cm. longis robustis viridibus ab apice erecto lato vel primae vel hinc inde ulterioris furcationis et quam ea uno anno tardius evolutis.

Running stem nearly superficial; upright parts 2-3 dm. high, stiffly erect, maturing fruit in October after third or fourth year; upright stem extension 3 cm. yearly, bearing two branches 5- to 7-forked, flat or convex above, concave below, 2 to 3 mm. broad, branchlets rarely extending the second year; leaves minute, adpressed; strobiles 4 (or rarely 5) $2\frac{1}{2}$ to 4 cm. long, often pointed, on stout, twice forked pedicels; peduncles 7 cm. long, stout, green, from broad erect end of first or sometimes more remote forking of branches, and growing in year following the production of branch.

I propose to show that there is abundant reason for according specific rank to this plant and incidentally to show that it is unique

among our club mosses. It is as distinct from *L. complanatum* L. as is *L. tristachyum* Pursh, and it would do no more violence to a natural classification to make the latter a variety of *L. complanatum* as has been done though perhaps unwittingly as *L. complanatum*, var. *Chamaecyparissus* Milde., than to continue *L. flabelliforme* a variety of *L. complanatum*. The two plants *L. complanatum* and *L. tristachyum* have several distinctive characters in common — they have underground rootstocks, ripen their fruit early in the season, have slender peduncles growing from nearly similar points, and enlarge by growth from the ends of all branches, while *L. flabelliforme* has different or just the opposite characters.

L. complanatum is a skeleton-like, unattractive plant with rootstocks usually well down in the leaf-mould or soil, and the stems arise like distinct plants rather than like those of a trailer. In order to secure a specimen with its rootstock vigorous digging is necessary. One would hardly think of gathering it for decorative purposes. The early maturing strobiles are hardly an inch (2 cm.) long, from one to three in number, more commonly one, borne on a slender peduncle from $1\frac{1}{4}$ to 2 inches (3 to 5 cm.) long. The pedicels are very short, often apparently wanting, and the two strobiles when there are two arise side by side nearly or quite touching. The strobiles are sometimes forked being single at the base and the forking at any place above. The fruiting part appears to be a very insignificant portion of the plant and during the fall season is hardly noticeable, but it remains like that on *L. flabelliforme* though somewhat battered through several years.

L. flabelliforme has a regular, stocky, very attractive appearance; the rootstock is usually almost on the surface of the ground and the plant is used like a vine for decorative purposes and can well be compared with *L. clavatum* L. for such uses, while *L. complanatum* can only be used like *L. obscurum* L. The four (sometimes five) strobiles averaging about an inch (2.5 cm.) long, but varying much and often having a long point, maturing very late in the season, mark very distinctly the outline of a square prism, and are immediately supported by prominent two-forked pedicels borne on a stout, erect peduncle about 3 in. (7 cm.) in length. The fruiting part is thus very prominent.

But *L. flabelliforme* is also distinguished from *L. complanatum* by its method of growth which I think is unique in this genus and is of

especial interest in distinguishing this species from other much-branched ones. According to my observation, in all club mosses except *L. flabelliforme* the ends of all branches and stems are growing points, are tipped with buds. The end of each season's growth is marked by a joint, the position of which in some species *L. annotinum* and *L. clavatum* for examples is very noticeable. In *L. complanatum* the leaves being very minute the axis is practically naked and, marking the end of each season's growth, there is plainly shown a sharp constriction resembling the separation of the thorax and abdomen of a wasp, and each year's growth resembles an elongated sausage.

The growth of *L. flabelliforme* is entirely upward, that is it does not increase laterally. Its growth consists of an annual elongation of the stem of about $1\frac{1}{2}$ inches (3 to 5 cm.) which, a short distance ($\frac{1}{2}$ to 1 cm.) below the top of the terminal bud, sends out two branches which fork and re-fork from five to seven times and result in giving a striking resemblance to a funnel or tunnel with its sides rising at an angle of 30° from a perpendicular, the slant height of the inverted cone being $1\frac{1}{4}$ to 2 inches (3 to 5 cm.). A branch or a part of a branch when flattened has the appearance of a fan, the fact being that it is funnel-form in the field and flabelliforme in the herbarium. Growth from the ends of these branchlets rarely takes place indicating that they are commonly either destitute of buds or that the buds are dormant and the plant grows (except in rare instances) only by a succession of funnel-bearing increases of stems, the funnels completed (except rarely) the first season.

This feature in the structure of this species can be finely shown by comparing *L. tristachyum* or *L. obscurum* with *L. flabelliforme* in the field when the new growth is appearing or is just grown, or by comparing them in the herbarium if secured at this time. If they are exposed to the sun or dry air when secured the new growth soon wilts and the former two will be covered with a wilted fringe, while the latter shows no wilting except the upmost story which will wilt beyond recognition.

L. complanatum makes an annual upward growth according to the same general plan as *L. flabelliforme* which plan however is obscured in the manner of its carrying out. The stem additions are more slender, zigzag, the terminal bud less conspicuous, while the pair of branches are at first very small though unlike *L. flabelliforme* they increase by lateral forking for two or three years.

Not all of the upright parts of these plants ever fructify in either species. Those that do not and which in consequence are often called sterile, continue to increase in the same manner as at first, the fifth year's growth of *L. flabelliforme* being a duplication of the second, etc. The others which by contrast may be called fertile when three or four years old make a change. In *L. flabelliforme* half of the first forking of each branch instead of forking again and again, develops into a broad stem-like segment often one half of an inch high (1.2 cm.) from which the next season the stout peduncle ascends. From this time on the energy of the plant is put into fruiting and the branches, now reduced to one-half of their former breadth, become smaller and smaller in each year's addition, giving the fertile upright parts, or "plants" conical appearance while the sterile ones appear cylindrical. Sometimes the fruiting is from the second or even the third forking but not often. In *L. complanatum* the fruiting is from the second forking generally, but often from the third, and as might be supposed the branch end from which arises the slender peduncle is little or no different in appearance from the others, and the fertile and sterile branches are not noticeably different except, as has been stated already, that the fruiting parts more or less entire always remain, but unlike those of *L. flabelliforme* these are not conspicuous.

Both species are often 12 inches (3 dm.) high "over all." If *L. complanatum* had the stout, erect stem of *L. flabelliforme* it would be much taller. The extreme age any of the upright stems attain is problematical, perhaps ten years. I have had a pretty intimate acquaintance with *L. flabelliforme* for at least ten years, but not till 1909 did I get acquainted with *L. complanatum*. My specimens which I have used in the preparation of this paper and which I collected very carefully and deliberately and in goodly numbers, given in a thin hard woods in Caribou, Maine, in the latitude of Quebec, 46° 50'.

I assume that our American form of *L. complanatum* is the same as the European, but I am not sure. Then again there may be other species sheltered under that name. Two have now been segregated and in my northern searches for *Rubus* I saw some forms of *L. complanatum* which I did not carefully examine but which I suspect were at least not typical.

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